

## ***Interactive comment on “Atmosphere–ocean exchange of heavy metals and polycyclic aromatic hydrocarbons in the Russian Arctic Ocean” by Xiaowen Ji et al.***

### **Anonymous Referee #2**

Received and published: 10 September 2019

Review of “Atmosphere-ocean Exchange of heavy metals and polycyclic aromatic hydrocarbon in the Russian Arctic Ocean”.

This work reports the concentrations of PAHs and metals in air, water and snow in the Russian sector of the Arctic. There is no previous data for this sector, so this contribution is very important. The work is of mix quality, with sections that are generally well done, but other material that is erroneous or needs further work. The manuscript needs some work in order to present the data appropriately, improve the comparison with other studies for polar regions, and give some extra depth to the discussion. This revision is mainly for the PAHs part. I suggest moderate to major modifications before

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it can be accepted.

- Line 40. Comment and cite a work on long-range atmospheric transport of PAHs (or pops) to the arctic.
- Line 49-50. Provide examples, there are some published for Antarctica and the Arctic for both metals and pahs.
- Note that not all PAHs are persistent, it also depends if they are found in the gas or dissolved phase (less persistent) or associated to aerosols and particulate matter.
- Line 73. Biogeochemical instead of biochemical
- Line 77-79. Specify if you are referring to rain or snow, or both. I guess snow.
- Line 110. This citation is not adequate here.
- Line 116. I guess that first in aluminum foil and after in polyethylene bags, which must be air-tight.
- Line 119. Was snow melted immediately? How was snow melted?
- Line 123. M3 or L, these are huge volumes. I have never seen such large volumes for water using a XAD. Unless there is a typo mistake, such volumes need a justification and discussion.
- Line 265. It cannot be equation 13.
- Line 266. Is this concentration appropriate for the arctic? Discuss.
- Line 269-270. I cannot understand this sentence if these estimations have just been explained.
- Line 370. In addition to the highest, provide the range for each basin. Generally, the values commented here do not correspond always to the values seen in Figure 5.
- Line 372. The concentrations in aerosols are extremely high! These need a compar-

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ison with other studies and a discussion. Which is the black carbon concentration in aerosol for this region?

- Generally, compare the pahs and metal concentrations with other reports for the Arctic, even if these are for the north atlantic and north pacific.
- Line 391. Here or in the methods, comment the range of estimated dry deposition velocities.
- Line 395. Huge values, If possible compare with other measures. Report as well the concentrations in snow.
- Line 398. Comment the range of diffusive fluxes, and show them in a figure, maybe in the supplementary material.
- Line 399 and figure 6b. This is not clear to me. For which pahs there is a net volatilization and for which there is a net deposition.
- Line 413. Rewrite. As I understand them, these fluxes for the the basins studied, but not all the Arctic, which should be clarified. Provide the surface for each basin in methods.
- Review the spelling of pah's names in figure 4 and 5. The size of the legend (scale) in the figures should be bigger.
- Review the use of English in the manuscript.
- Table S4. Why dibenzothiophene and anthracene appear twice in this table, while phenanthrene is not there? Review all the tables and data set. In addition, the mean total concentrations seem to not correspond to the distribution seen in Figure 5.
- Figure S5. The three legends appear as Cg. . . correct.
- Improve the quality of the figures in the supplementary material. Generally, the presentation aspects of this work need to be reviewed.

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Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2019-653>, 2019.

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